Mailing Address:
Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:
Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

Phone: (307) 766-6651
Fax: (307) 766-3785

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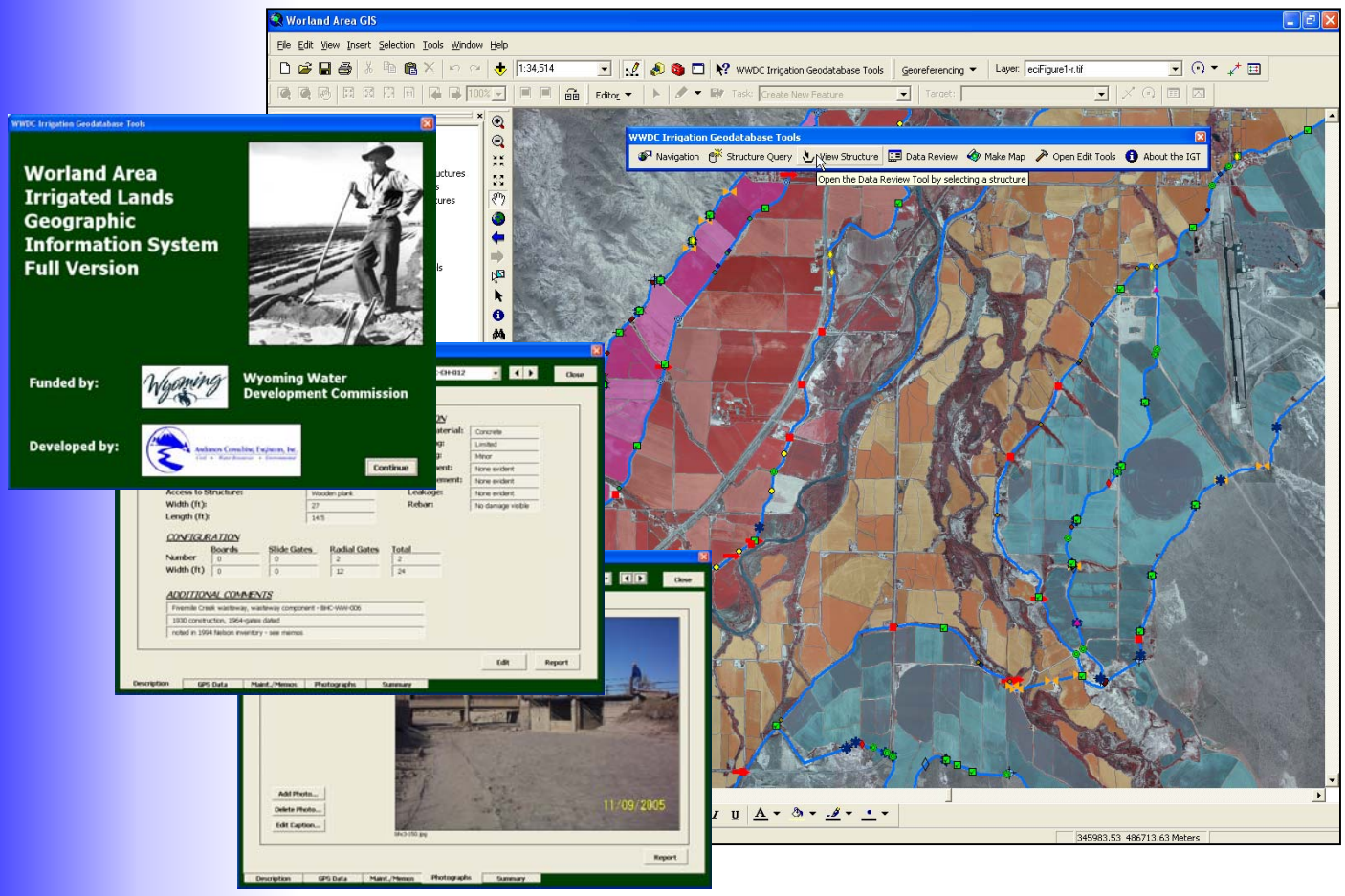
EXECUTIVE SUMMARY
FOR
WORLAND AREA IRRIGATED LANDS
GEOGRAPHIC INFORMATION SYSTEM (GIS)
LEVEL II FEASIBILITY STUDY

Prepared For:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002



Prepared By:

Anderson Consulting Engineers, Inc.
772 Whalers Way, Suite 200
Fort Collins, CO 80525

ANDERSON CONSULTING ENGINEERS, INC.
Civil • Water Resources • Environmental

March 16, 2007

EXECUTIVE SUMMARY

WORLAND AREA IRRIGATED LANDS GIS LEVEL II

Prepared for:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002

Prepared by:

Anderson Consulting Engineers, Inc.
772 Whalers Way, Suite 200
Fort Collins, CO 80525
(ACE Project No. WYWDC23)

March 16, 2007

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I. INTRODUCTION

On June 2, 2005 Anderson Consulting Engineers, Inc. (ACE) entered a contract with the Wyoming Water Development Commission (WWDC) to provide professional services to the Worland Irrigated Lands GIS Project, Level II. Five irrigation districts in the vicinity of Worland, Wyoming, joined together with the common goal of having their irrigation conveyance systems digitally mapped. The purpose of the project was to develop a user-friendly Geographic Information System (GIS) that incorporates a database of information collected during a comprehensive inventory of irrigation systems. The GIS and its database can then be used by the Districts as a living, updateable map of the area allowing them to each modernize their maintenance schedules as well as defining their rehabilitation needs. The districts comprising this group are:

Big Horn Irrigation District
Bluff Irrigation District
Upper Bluff Irrigation District Upper
Hanover Irrigation District
Highland Hanover Irrigation District

II. DATA COLLECTION

Initial data collection efforts concentrated on the compilation and review of spatial data already generated and put into use by other local, state and federal entities. Pertinent spatial data was collected from these agencies and incorporated into the Project GIS.

In addition, the Wyoming Water Development Commission (WWDC) has undertaken statewide water basin planning efforts in selected river basins. At the time of this study, the Wind/Bighorn River Basin system, had recently been completed. ACE also incorporated information from this basin plan as well as other previously published investigations funded by the WWDC which were specific to several of the districts.

III. COMPUTER SYSTEM REQUIREMENTS

The project GIS was developed using ArcView 9.1 software developed by ESRI. To fully utilize the database and tools developed during this project a computer system capable of accessing and operating the database was prescribed. Table 1 displays the minimum computer capabilities in terms of computational capacity and memory as recommended by ESRI and modified by ACE.

Table 1. Minimum Computer Capabilities.

Item	ESRI Recommendations	ACE Recommendations
CPU Speed	1.0 GHz or higher	2.0 GHz minimum
Processor	Intel Pentium or Intel Xenon Processors	Same
Memory/Ram	512 MB minimum / 1 GB recommended or higher	1 GB minimum
Display Color	256 color depth	Same
Disk Space	No recommendations	100 GB minimum

Table 2 presents the estimated costs of purchasing a computer, monitor, printer, software, and backup storage system. Included in this cost estimate is the cost of a ledger sized (11" x 17") color laserjet printer.

Table 2. Estimated Costs of Computer System.

Item	Cost
PC Computer with Monitor	$2,000
Ledger Sized (11" x 17") Color Laserjet Printer (1)	$3,000
Software: ArcView v. 9.2 Microsoft Access	 $1,500 $125
Backup Storage	$250
Total	**$6,875**

A survey was conducted to determine existing computer resources and user capabilities. While the cosponsors all showed a definite interest and level of enthusiasm regarding this project, most did not possess computer systems capable of providing an adequate platform for the GIS.

The Washakie County Conservation District (WCCD) has offered to provide space in their office for the districts to house a computer system dedicated to the Worland Area Irrigated Lands GIS. Under this deployment scenario, the districts would jointly purchase the requisite computer hardware and software. The WCCD would then provide space in their office for the districts to set the system up and make it available for their use. At the time this report was prepared, the GIS had been installed on a WCCD computer that is *not* available for general public use. In order to access the GIS, the user must be in the company of WCCD staff. This scenario makes the GIS available for use but limits its accessibility because WCCD staff must be available.

IV. GIS DEVELOPMENT

In the field, Anderson Consulting Engineers mapped each canal using Trimble GeoXT and GeoXM hand-held GPS units. These units facilitate rapid and efficient mapping and collection of spatial data with sub-meter accuracy. The following types of structures were located and evaluated:

Check Structures
Farm Turnouts
Lined Reaches
Bridges
Channel Features
Culverts
Diversions
Siphons
Pipeline Crossings
Drop Structures
Measurement Devices
Wasteways
Field Drain Outlets

It is important to keep in mind that irrigation infrastructure often consists of structures consisting of multiple components. For example, a wasteway structure may consist of a check structure on the canal, a wasteway on the canal levee, and a drop structure conveying operational wastes downslope away from the canal. In these instances, field crews mapped the individual components of the structure in an effort to best define the functionality of a structure. Consequently, evaluation of the structure described above would result in a total of three individual features being added to the GIS.

In order to facilitate the management of data associated with several thousand individual structures and appurtenant features, every individual structure was assigned a unique identifier. The identifier is referred to in all data tables as the IDENT. The IDENT consists of a three letter

prefix identifying the canal, a two letter designation of the type of structure, and a three digit number assigned sequentially.

Irrigation Geodatabase Tool

An important objective of the project was to create a GIS, which the layman could use and obtain useful information and mapping without specialized training. ACE developed Version 1 of the Irrigation Geodatabase Tool (IGT), which takes the user "by the hand" and guides them through key functions of the GIS. It consists of a suite of individual tools, developed using Visual Basic, that enable even the novice user to utilize the powerful functionality of the GIS, to review existing data, and to modify and edit data.

IGT Navigation Tools : The Navigation tools enable the GIS user to navigate spatially throughout the areal extent of the GIS. Using pull down menus, the user can select any of three means of modifying the visible extent of the GIS: Township/Range/Section, canal segment, or map book page.

IGT Query Tool: The Query Tool allows the user to query the data contained within geodatabase to extract information such as structure condition, functionality, and rehabilitation needs. The user can generate a list of structures meeting the search criteria, which can be based upon canal system, type of structure, and overall condition.

IGT Data Review Table: The Data Review Table (DRT) can be considered the "workhorse" of the customized tools. A primary function of the DRT is to present the feature attributes and associated data in a clear and easy to read format. The DRT is divided into five distinct tables: Description, GPS Data, Maintenance Memos, Photographs, and Summary. In addition, the DRT facilitates data editing within the form and report generation.

IGT Map Tool: This tool allows the user to generate formatted maps of any GIS view. By clicking on Make Map, the GIS automatically switches to ArcView's layout mode and initiates the generation of a map using user-selected criteria.

IGT New Feature: As structures are replaced or new structures added to any of the irrigation systems, the user can add them to the geodatabase using this feature.

In summary, the IGT consists of a suite of GIS tools developed specifically for the irrigation district manager and its individual water users.

V. SYSTEM INVENTORY AND EVALUATION

The five canal systems were inventoried during the non-irrigation season beginning in the Fall of 2005 and ending in the Spring of 2006. A total of 130.2 miles of canal and associated structures were inventoried. Table 3 summarizes the various types of structures encountered. As indicated in this table, a total of 1,141 structures were inventoried and evaluated.

Table 3. Summary of Canal Structures Inventoried.

Structure Type	Big Horn Canal	Bluff Canal	Highland Hanover Canal	Upper Bluff Canal	Upper Hanover Canal	Total
Bridges	39	11	1	0	17	68
Check Structures	29	10	35	14	32	120
Culverts	18	11	21	6	14	70
Drop Structures	8	1	16	4	3	32
Farm Turnouts	283	70	88	34	204	679
Headgates	1	1	1	2	1	6
Lined Reaches	3	0	5	3	6	17
Measurement Devices	5	2	46	20	2	75
Pipes	1	3	9	4	2	19
Siphons	4	7	8	5	3	27
Wasteways	11	7	1	3	11	33
Total	**402**	**123**	**231**	**95**	**295**	**1146**
Total Conveyance/Control (1)	**75**	**40**	**96**	**41**	**72**	**324**

(1) Total structures excluding bridges, farm turnouts, and measurement devices.

Big Horn Canal

A total of 402 individual structures were inventoried on the Big Horn Canal (Table 4). Of this total, 75 are considered to be flow conveyance and control structures. This number excludes farm turnouts (283), bridges (39) and measurement devices (5). The majority of structures were characterized as being either "fair" or "good" condition. However, the system infrastructure is old and many structures are showing the effects of nearly a century of wear, particularly drop structures and check structures.

Table 4. Tabulation of Structures Inventoried on the Big Horn Canal.

Feature	Good	Fair	Poor	Failing	Total
Bridge	24	12	3	0	39
Check Structure	2	18	8	1	29
Culvert	10	8	0	0	18
Drop Structure	0	2	6	0	8
Farm Turnout	202	72	8	1	283
Headgate	0	0	1	0	1
Lined Reach	2	0	0	1	3
Measurement Device	4	1	0	0	5
Pipe	0	1	0	0	1
Siphon	4	0	0	0	4
Wasteway	3	4	4	0	11
Total	**251**	**118**	**30**	**3**	**402**
Total Conveyance/Control (1)	**21**	**33**	**19**	**2**	**75**

(1) Total structures excluding bridges, farm turnouts, and measurement devices.

Bluff Canal

Inspection of Bluff Canal infrastructure indicated that the canal and its associated infrastructure are in generally fair to good condition. A total of 123 structures were evaluated, 40 of which can be classified as conveyance structures. This number excludes farm turnouts (70), bridges (11) and measurement devices (2). Five of these structures were classified as either "poor" or "failing" and in need of replacement. Results of the Bluff Canal inventory effort are tabulated in Table 5.

Table 5. Tabulation of all Inventoried Structures in the Bluff Canal System.

Feature	Good	Fair	Poor	Failing	Total
Bridges	1	8	2	0	11
Check Structures	1	5	4	0	10
Culverts	4	7	0	0	11
Drop Structures	0	0	1	0	1
Farm Turnouts (FTO)	4	39	19	8	70
Headgates	0	1	0	0	1
Lined Reaches	0	0	0	0	0
Measurement Devices	1	1	0	0	2
Pipelines	2	1	0	0	3
Siphons	1	6	0	0	7
Wasteways	2	5	0	0	7
Total	**16**	**73**	**26**	**8**	**123**
Total Conveyance/Control (1)	**10**	**25**	**5**	**0**	**40**

(1) Total structures excluding bridges, farm turnouts, and measurement devices.

Upper Hanover Canal

A total of 295 individual structures were inventoried on the Upper Hanover Canal (Table 6). Of this total, 72 are considered to be flow conveyance and control structures. This number excludes farm turnouts (204), bridges (17) and measurement devices (2). The majority of them were characterized as being either "fair" or "good" condition. Of the 72 conveyance structures inventoried, 15 structures were identified which are in need of rehabilitation or replacement.

Table 6. Tabulation of Structures Inventoried on the Upper Hanover Canal.

Feature	Good	Fair	Poor	Failing	Total
Bridge	3	9	5	0	17
Check Structure	2	23	4	3	32
Culvert	8	5	1	0	14
Drop Structure	0	1	0	2	3
Farm Turnout	8	146	39	11	204
Headgate	0	1	0	0	1
Lined Reach	0	3	1	2	6
Measurement Device	0	2	0	0	2
Pipe	0	2	0	0	2
Siphon	2	1	0	0	3
Wasteway	6	3	1	1	11
Total	**29**	**196**	**51**	**19**	**295**
Total Conveyance/Control (1)	**18**	**39**	**7**	**8**	**72**

(1) Total structures excluding bridges, farm turnouts, and measurement devices.

Highland Hanover Canal

Inspection of Highland Hanover Canal infrastructure indicated that the canal and its associated infrastructure are in generally fair to good condition. A total of 231 structures were evaluated. Of the 96 conveyance-related structures, only 3 were classified as 'failing' and 5 as being in "poor" condition. Table 7 summarizes the results of the system inventory. The Highland Hanover Canal system relies upon pump stations which lift irrigation water from the Upper Hanover Canal to the Highland Hanover system. These pumps or their associated facilities were not inventoried during this field effort. These facilities were evaluated in detail in 1988 (Centennial Engineering, 1988).

Table 7. Tabulation of Inventoried Structures on the Highland Hanover Canal Irrigation System.

Feature	Good	Fair	Poor	Failing	Total
Bridge	0	1	0	0	1
Check Structure	10	20	3	2	35
Culvert	13	8	0	0	21
Drop Structure	8	8	0	0	16
Farm Turnout	37	34	11	6	88
Headgate	1	0	0	0	1
Lined Reach	2	0	2	1	5
Measurement Device	20	16	4	6	46
Pipe	6	3	0	0	9
Siphon	2	6	0	0	8
Wasteway	0	1	0	0	1
Total	**99**	**97**	**20**	**15**	**231**
Total Conveyance/Control (1)	**42**	**46**	**5**	**3**	**96**

(1) Total structures excluding bridges, farm turnouts, and measurement devices.

Upper Bluff Canal

Inspection of Upper Bluff infrastructure indicated that the canal and its associated infrastructure are in generally good condition. A total of 95 structures were evaluated. Of the 41 conveyance-related structures, only 1 was classified as 'failing' and 1 as being in "poor" condition. Table 8 summarizes the results of the system inventory. The Upper Bluff Canal system relies upon pump stations which lift the irrigation water from the Bluff Canal to the Upper Bluff system. These pumps or their associated facilities were not inventoried during this field effort.

Table 8. Tabulation of Inventoried Structures on the Upper Bluff Canal Irrigation System.

Feature	Good	Fair	Poor	Failing	Total
Bridges	0	0	0	0	0
Check Structures	8	4	1	1	14
Culverts	2	4	0	0	6
Drop Structures	4	0	0	0	4
Farm Turnouts (FTO)	17	15	2	0	34
Headgates	2	0	0	0	2
Lined Reaches	1	2	0	0	3
Measurement Devices	10	8	0	2	20
Pipelines	4	0	0	0	4
Siphons	2	3	0	0	5
Wasteways	3	0	0	0	3
Total	**53**	**36**	**3**	**3**	**95**
Total Conveyance/Control (1)	**26**	**13**	**1**	**1**	**41**

(1) Total structures excluding bridges, farm turnouts, and measurement devices.

VI. CONCEPTUAL DESIGNS AND COST ESTIMATES

Following the development of the rehabilitation plan for each of the participating canals, conceptual design information was prepared. The information developed during the design process was utilized to generate cost estimates for implementation of the individual improvements. Consequently, conceptual design information/details and cost estimates were developed for a total of 48 improvements. It should be noted that this information did not include drawings for the replacement or rehabilitation of individual farm turnout structures or measurement devices.

A final cost estimate and repayment plan, presented in Table 9, was generated for the project improvements. As indicated in Table 9, the final cost estimate and repayment plan includes 10% for engineering services during construction and 15% for construction contingencies. With respect to the repayment plan, the total project cost for each improvement was utilized to determine the annual loan payment requirements (assuming WWDC funding is provided in the form of a 67 percent grant and 33 percent loan).

VII. CONCLUSIONS AND RECOMMENDATIONS

Based on the information presented in the previous chapters, the following conclusions and recommendations are provided.

- A Geographic Information System (GIS) was developed for five participating irrigation districts in the vicinity of Worland, Wyoming. The districts were:

Big Horn Canal	Bluff Canal	Upper Hanover Canal
Highland Hanover Canal	Upper Bluff Canal	

- The project GIS included a wide variety of information collected from existing sources and developed during the course of this project. Data collected from existing sources included coverages such as public land survey (PLSS), roads, parcel mapping, and hydrography, among others. It also included background imagery such as color infrared photography and USGS topographic mapping. Results of the field inventory and assessment of approximately 1,146 individual structures associated with the five participating canal districts was incorporated in the project geodatabase.

- An Irrigation Geodatabase Tool (IGT) was developed to enable the project co-sponsors to navigate the GIS, to utilize the databases, and to generate maps. The IGT consists of a suite of tools developed using Visual Basic and packaged into a user-friendly graphic user's interface (GUI). The IGT allows the user to query the extensive geodatabase to extract information such as structure condition, functionality, and rehabilitation needs. The IGT facilitates data editing in an easy to read data form, bypassing cumbersome editing routines otherwise required by the GIS software. Navigation is facilitated via any of several options: Public Land Survey System, Map Index, or Canal Segment. Maps can then be formatted and printed within a menu driven interface.

Table 9. Worland Area Irrigated Lands GIS Final Cost Estimates.

Priority/Item Number	Design Sheet	Structure Type	GIS Identifier	Canal/Lateral Station (mile)	Cost of Project Components	Engineering (10%)	Subtotal	Contingency (15%)	Total Construction Costs	Final Plans/Specifications	Permitting and Mitigation	Legal Fees	Access and Right-of-Way	Total Project Cost	Annual Payment[1]	Assessment[2] (Cost/Acre)
Big Horn Canal Structures																
BHC-1	1	Lined	BHC-LI-003	6.410	$321,750	$32,175	$353,925	$53,089	$407,014	$30,000	$2,000	$500	$1,000	$440,514	$10,697	$0.47
BHC-2	2	Check/Headgate	BHC-CH-002 / BHC-HG-001	0	$271,170	$27,117	$298,287	$44,743	$343,030	$28,000	$2,000	$500	$1,000	$374,530	$9,094	$0.40
BHC-3	3	Wasteway / Drop	BHC-WW-002 / BHC-DR-006	1.318	$133,026	$13,303	$146,329	$21,949	$168,278	$18,000	$2,000	$500	$1,000	$189,778	$4,608	$0.20
BHC-4	4	Check	BHC-CH-003	1.321	$234,911	$23,491	$258,402	$38,760	$297,162	$27,000	$2,000	$500	$1,000	$327,662	$7,956	$0.35
BHC-5	5	Check	BHC-CH-005	4.203	$46,633	$4,663	$51,296	$7,694	$58,990	$10,000	$2,000	$500	$1,000	$72,490	$1,760	$0.08
BHC-6	6	Wasteway / Drop	BHC-WW-003 / BHC-DR-007	8.498	$142,186	$14,219	$156,405	$23,461	$179,865	$18,000	$2,000	$500	$1,000	$201,365	$4,890	$0.21
BHC-7	4	Check	BHC-CH-007	8.502	$234,911	$23,491	$258,402	$38,760	$297,162	$27,000	$2,000	$500	$1,000	$327,662	$7,956	$0.35
BHC-8	7	Check	BHC-CH-008	13.640	$10,868	$1,087	$11,954	$1,793	$13,747	$2,500	$1,000	$500	$500	$18,247	$443	$0.02
BHC-9	8	Check	BHC-CH-012	24.835	$198,967	$19,897	$218,864	$32,830	$251,694	$17,000	$5,000	$500	$1,000	$275,194	$6,682	$0.29
BHC-10	9 & 10	Wasteway / Drop	BHC-WW-006 / BHC-DR-008	24.831	$254,984	$25,498	$280,482	$42,072	$322,554	$28,000	$5,000	$3,000	$3,000	$361,554	$8,779	$0.38
BHC-11	11	Wasteway	BHC-WW-007	31.735	$64,423	$6,442	$70,865	$10,630	$81,495	$11,000	$2,000	$500	$1,000	$95,995	$2,331	$0.10
BHC-12	11	Drop	BHC-DR-003	31.737	$119,198	$11,920	$131,117	$19,668	$150,785	$19,000	$2,000	$500	$1,000	$173,285	$4,208	$0.18
BHC-13	5	Drop	BHC-DR-004	34.113	$36,582	$3,658	$40,240	$6,036	$46,276	$10,000	$2,000	$500	$1,000	$59,776	$1,451	$0.06
BHC-14	12	Drop	BHC-DR-005	39.205	$66,901	$6,690	$73,591	$11,039	$84,630	$13,000	$2,000	$500	$1,000	$101,130	$2,456	$0.11
BHC-15	13	Check	BHC-CH-017	39.208	$157,930	$15,793	$173,722	$26,058	$199,781	$20,000	$2,000	$500	$1,000	$223,281	$5,422	$0.24
BHC-16	14	Check	BHC-CH-025	50.736	$23,874	$2,387	$26,261	$3,939	$30,201	$4,500	$2,000	$500	$1,000	$38,201	$928	$0.04
BHC-17	14	Check	BHC-CH-026	50.973	$22,149	$2,215	$24,364	$3,655	$28,018	$4,500	$2,000	$500	$1,000	$36,018	$875	$0.04
BHC-18	15	Check	Proposed	36.44	$26,174	$2,617	$28,791	$4,319	$33,110	$4,500	$2,000	$500	$1,000	$41,110	$998	$0.04
													Project Total	**$3,357,792**	**$81,534**	**$3.55**
Bluff Canal Structures																
BFC-1	16	Drop	BFC-DR-001	0.958	$75,820	$7,582	$83,401	$12,510	$95,912	$13,000	$2,000	$500	$1,000	$112,412	$2,730	$0.55
BFC-2	14	Check	BFC-CH-002	2.025	$22,149	$2,215	$24,364	$3,655	$28,018	$4,500	$2,000	$500	$1,000	$36,018	$875	$0.18
BFC-3	14	Check	BFC-CH-005	8.466	$22,149	$2,215	$24,364	$3,655	$28,018	$4,500	$2,000	$500	$1,000	$36,018	$875	$0.18
BFC-4	14	Check	BFC-CH-006	9.054	$22,149	$2,215	$24,364	$3,655	$28,018	$4,500	$2,000	$500	$1,000	$36,018	$875	$0.18
BFC-5	17	Check	BFC-CH-008	10.854	$16,330	$1,633	$17,963	$2,694	$20,657	$3,500	$1,000	$500	$500	$26,157	$635	$0.13
													Project Total	**$246,625**	**$5,989**	**$1.20**

(1) Based on a loan equal to 33% of the total project cost at 4.0% interest with a loan of 20 years.

(2) Based on the following approximate acreage: Big Horn 22971 acres; Bluff 4970 acres

Table 9. Worland Area Irrigated Lands GIS Final Cost Estimates (Continued).

Priority/Item Number	Design Sheet	Structure Type	GIS Identifier	Canal/Lateral Station (mile)	Cost of Project Components	Engineering (10%)	Subtotal	Contingency (15%)	Total Construction Costs	Final Plans/Specifications	Permitting and Mitigation	Legal Fees	Access and Right-of-Way	Total Project Cost	Annual Payment[1]	Assessment[2] (Cost/Acre)
Upper Hanover Canal Structures																
UHC-1	1	Lined	UHC-LI-005	3.013	$5,610	$561	$6,171	$926	$7,097	$1,500	$1,500	$0	$0	$10,097	$245	$0.02
UHC-2	1	Lined	UHC-LI-007	7.336	$1,980	$0	$1,980	$297	$2,277	$1,500	$1,500	$0	$0	$5,277	$128	$0.01
UHC-3	18	Wasteway	UHC-WW-007	13.881	$134,234	$13,423	$147,657	$22,149	$169,806	$18,000	$2,000	$500	$1,000	$191,306	$4,645	$0.35
UHC-4	19	Wasteway	UHC-WW-003	6.549	$133,136	$13,314	$146,449	$21,967	$168,416	$18,000	$1,800	$500	$1,000	$189,716	$4,607	$0.35
UHC-5	1	Lined	UHC-LI-008	7.439	$1,980	$0	$1,980	$297	$2,277	$1,500	$1,500	$0	$0	$5,277	$128	$0.01
UHC-6	14	Check	UHC-CH-014	22.845	$23,874	$2,387	$26,261	$3,939	$30,201	$4,500	$4,500	$500	$1,000	$40,701	$988	$0.07
UHC-7	14	Check	UHC-CH-015	23.010	$23,874	$2,387	$26,261	$3,939	$30,201	$4,500	$4,500	$500	$1,000	$40,701	$988	$0.07
UHC-8	14	Check	UHC-CH-019	25.660	$22,149	$2,215	$24,364	$3,655	$28,018	$4,500	$4,500	$500	$1,000	$38,518	$935	$0.07
UHC-9	15	Check	UHC-CH-009	17.749	$31,924	$3,192	$35,116	$5,267	$40,384	$9,000	$9,000	$500	$1,000	$59,884	$1,454	$0.11
UHC-10	15	Check	UHC-CH-010	18.274	$28,474	$2,847	$31,321	$4,698	$36,020	$8,500	$8,500	$500	$1,000	$54,520	$1,324	$0.10
UHC-11	20	Culvert	UHC-CU-010	23.517	$39,646	$3,965	$43,611	$6,542	$50,153	$5,000	$5,000	$500	$1,000	$61,653	$1,497	$0.11
UHC-12	14	Check	UHC-CH-021	26.318	$22,149	$2,215	$24,364	$3,655	$28,018	$4,500	$4,500	$500	$1,000	$38,518	$935	$0.07
UHC-13	16	Drop	UHC-DR-001	30.883	$28,100	$2,810	$30,910	$4,637	$35,547	$5,000	$5,000	$500	$1,000	$47,047	$1,142	$0.09
UHC-14	16	Drop	UHC-DR-002	31.803	$25,007	$2,501	$27,507	$4,126	$31,634	$5,000	$5,000	$500	$1,000	$43,134	$1,047	$0.08
UHC-15	17	Check	UHC-CH-032	34.623	$16,330	$1,633	$17,963	$2,694	$20,657	$3,500	$3,500	$500	$500	$28,657	$696	$0.05
													Project Total	**$855,005**	**$20,761**	**$1.57**
Highland Hanover Canal Structures																
HHC-1	17	Check	HHC-CH-014	7.210	$16,330	$1,633	$17,963	$2,694	$20,657	$3,500	$3,500	$500	$500	$28,657	$696	$0.11
HHC-2	17	Check	HHC-CH-010	6.034	$16,629	$1,663	$18,292	$2,744	$21,036	$3,500	$3,500	$500	$500	$29,036	$705	$0.11
HHC-3	1	Lined	HHC-LI-003	0.701	$2,324	$232	$2,556	$383	$2,940	$1,500	$1,500	$0	$0	$5,940	$144	$0.02
HHC-4	1	Lined	HHC-LI-002	0.572	$69,713	$6,971	$76,684	$11,503	$88,186	$1,100	$1,100	$500	$1,000	$91,886	$2,231	$0.34
HHC-5	1	Lined	HHC-LI-008	0.892	$10,230	$1,023	$11,253	$1,688	$12,941	$2,000	$2,000	$500	$500	$17,941	$436	$0.07
HHC-6	17	Check	HHC-CH-027	0.894	$12,880	$1,288	$14,168	$2,125	$16,293	$3,000	$3,000	$500	$500	$23,293	$566	$0.09
HHC-7	17	Check	HHC-CH-031	1.732	$12,880	$1,288	$14,168	$2,125	$16,293	$3,000	$3,000	$500	$500	$23,293	$566	$0.09
HHC-8	17	Check	HHC-CH-029	1.727	$12,880	$1,288	$14,168	$2,125	$16,293	$3,000	$3,000	$500	$500	$23,293	$566	$0.09
													Project Total	**$243,340**	**$5,909**	**$0.91**
Upper Bluff Canal Structures																
UBC-1	17	Check	UBC-CH-001	0.585	$14,605	$1,461	$16,066	$2,410	$18,475	$3,500	$3,500	$500	$500	$26,475	$643	$0.45
UBC-2	17	Check	UBC-CH-012	6.787	$12,880	$1,288	$14,168	$2,125	$16,293	$3,000	$3,000	$500	$500	$23,293	$566	$0.40
													Project Total	**$49,769**	**$1,208**	**$0.85**

(1) Based on a loan equal to 33% of the total project cost at 4.0% interest with a loan of 20 years.

(2) Based on the following approximate acreage:

Upper Hanover	13200 acres
Highland Hanover	6500 acres
Upper Bluff	1430 acres

- Each of the participating Districts was provided with a map atlas pertaining to the specific district. The map atlas included mapping of irrigated acreage and irrigation infrastructure projected on both USGS topographic mapping and color infrared photography.

- In order to maximize the utility of the project GIS, the project cosponsors must decide the direction they wish to take with respect to its location and management. Currently, none of the Districts with computer systems have expressed a willingness to purchase the required software and install the GIS. Likewise, none of the Districts without computer systems have expressed the interest to purchase the hardware and software necessary to manage the GIS. If the GIS is to become a viable management tool for use by the Districts, they must either:

  (1) individually purchase the requisite hardware/software and accept responsibility for its management or

  (2) accept the offer of the Washakie County Conservation District (WCCD) to provide housing for a communally purchased computer/software system.

- Results of the system inventories and evaluations indicate that structures within each of the Districts are in need of rehabilitation or replacement. Individual rehabilitation plans addressing these needs were developed for each of the participating Districts. These plans are provided as starting points for each District to use for rehabilitation planning.

- Conceptual designs and cost estimates were prepared for each component of the rehabilitation plans. For those items selected for Level III design and construction, the Districts should investigate funding through the Wyoming Water Development Commission (WWDC) Grant/Loan program (67% grant/33% loan grant).